Update from DUNE Laser Lab at LANL

DUNE-IoLS Meeting

Mattia + Laser crew (Eric, David, Sowjanya) - June 08, 2022

Test at 180 µs (from my last laser update)

- May 23
  - **QS = 180 µs**
  - No death
  - Energy measured (EM-1/2/3): 260/**38.1**/3
  - No plots. A software error stopped the acquisition
  - No big spike when opening the internal shutter but EM-2 energy much much lower than day 1: **38.1 mJ** Vs **72 mJ**.
    - Compatible with FHG windows damaged again
  - HG tuning was attempted after ~20 minutes data taking. 32 to 38 mJ

- Test will be repeated today

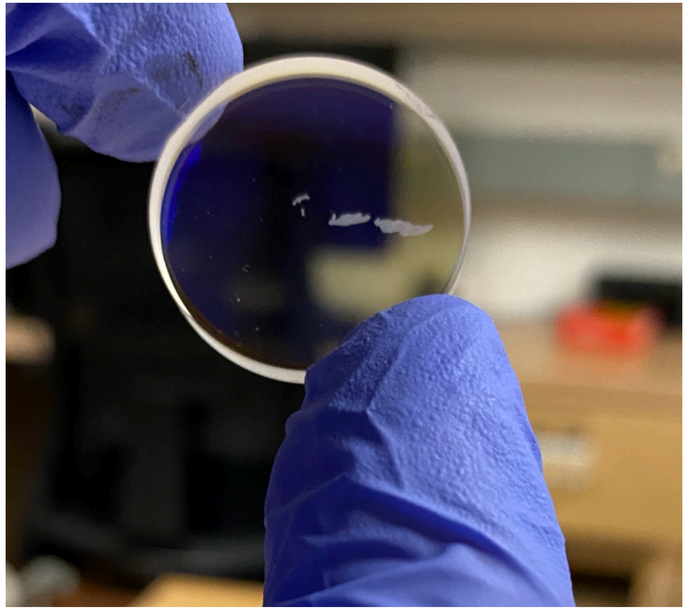
[https://indico.fnal.gov/event/54672/#preview:202746]

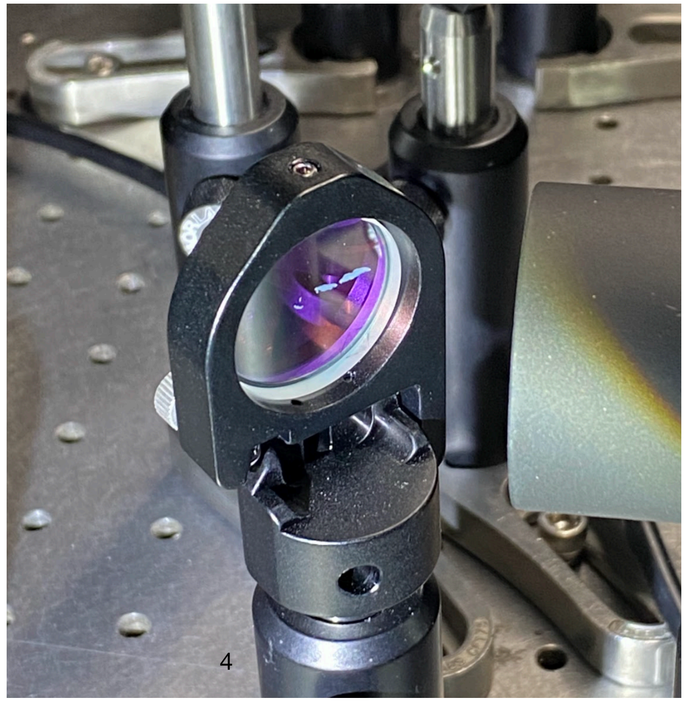
Repetition of Test at QS = 180 µs

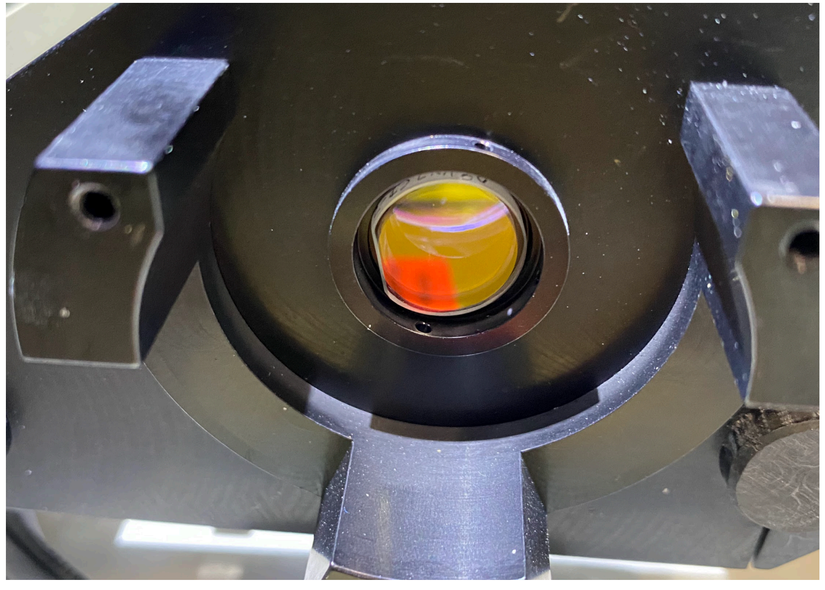
- May 24
  - Needed to repeat test at QS = 180 µs
    - not recorded because of a bug in the acquisition code
  - The second test confirmed the decrease of energy: 38 mJ at full energy
  - Plots (Eric) are missing. All looked regular
- Strong indications the laser internal optics are damaged again

The usual movie

- FHG exit window looks damaged
- Unlike last time, FHG entrance window looks still okay
- Some dust inside the laser bench
- M2 collected 2 additional marks in the first two days of resumed activity
  - We realigned to a new spot after day 1 - still there since then
- No difference with the status of other optics (Attenuator, mirrors)





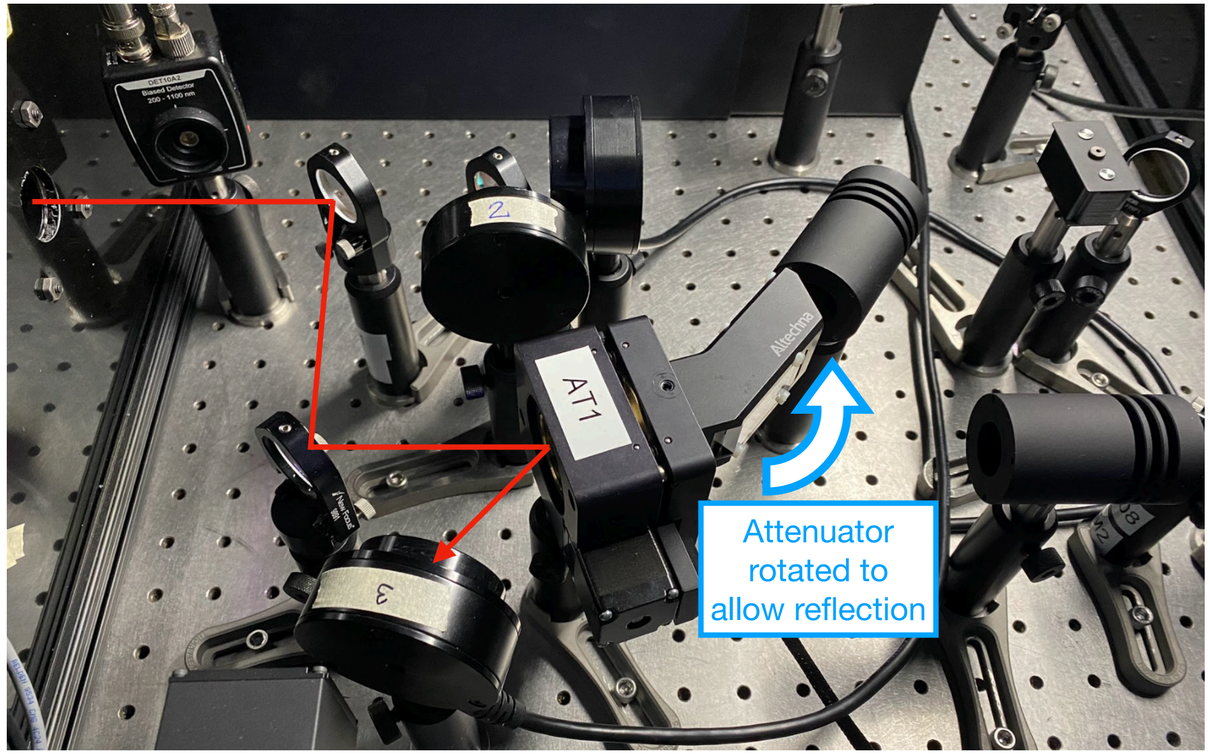


Recovering a workable energy level

+check for back reflections

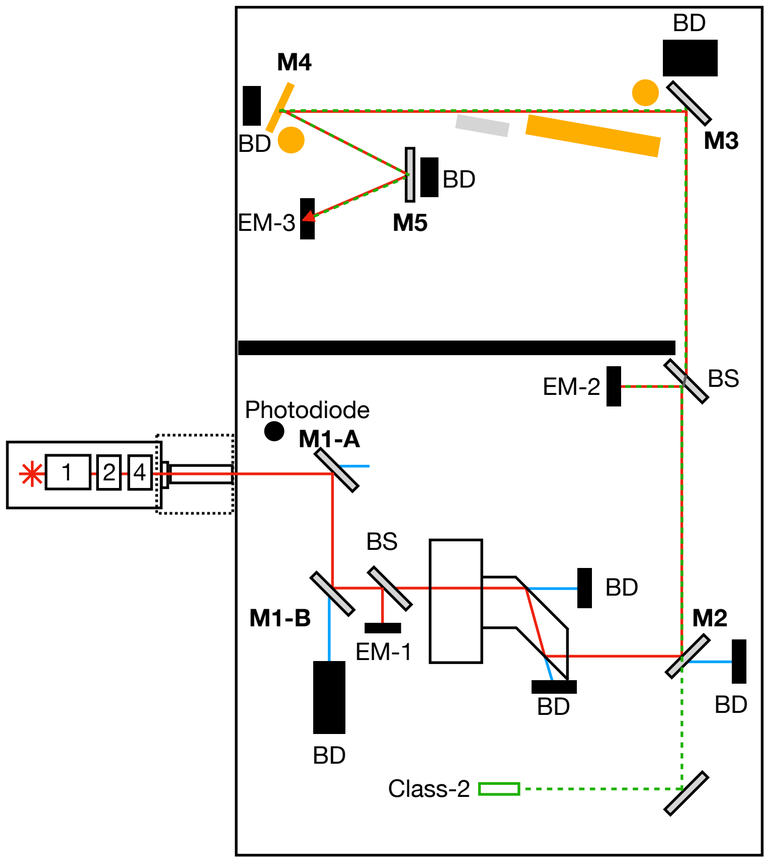
- Two days, a dedicated setup. Highest 266-nm energy: 39 mJ, QS = 180 µs
  EM-1/2/3 = 1064/532/266 = 147/125/38

- Check for reflections
  - Checked everywhere with beam card
  - Measured around attenuator entrance
    (most reasonable source of reflections)
    - Reflection: 0.28 mJ
      Other meters measuring
      compatible values
      with the measurement at aligned HG, QS = 180 µs: 142/125/0.28



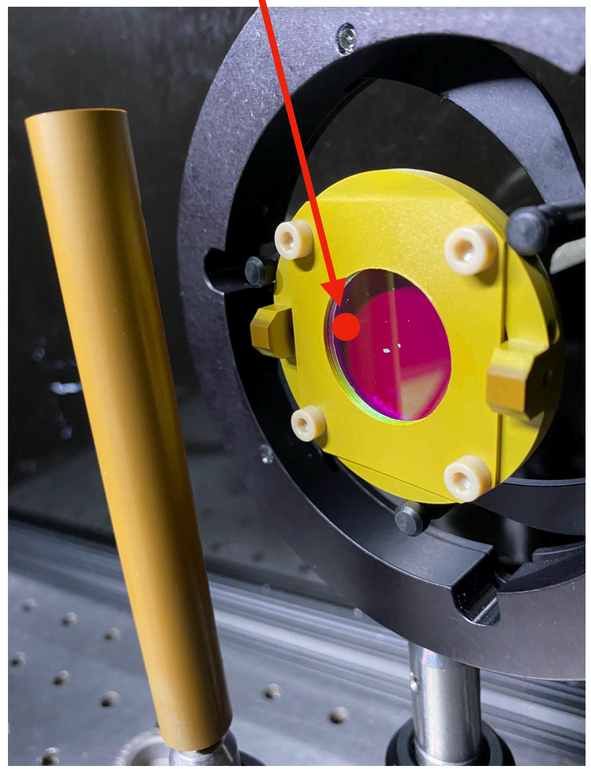
Periscope material exposure to UV

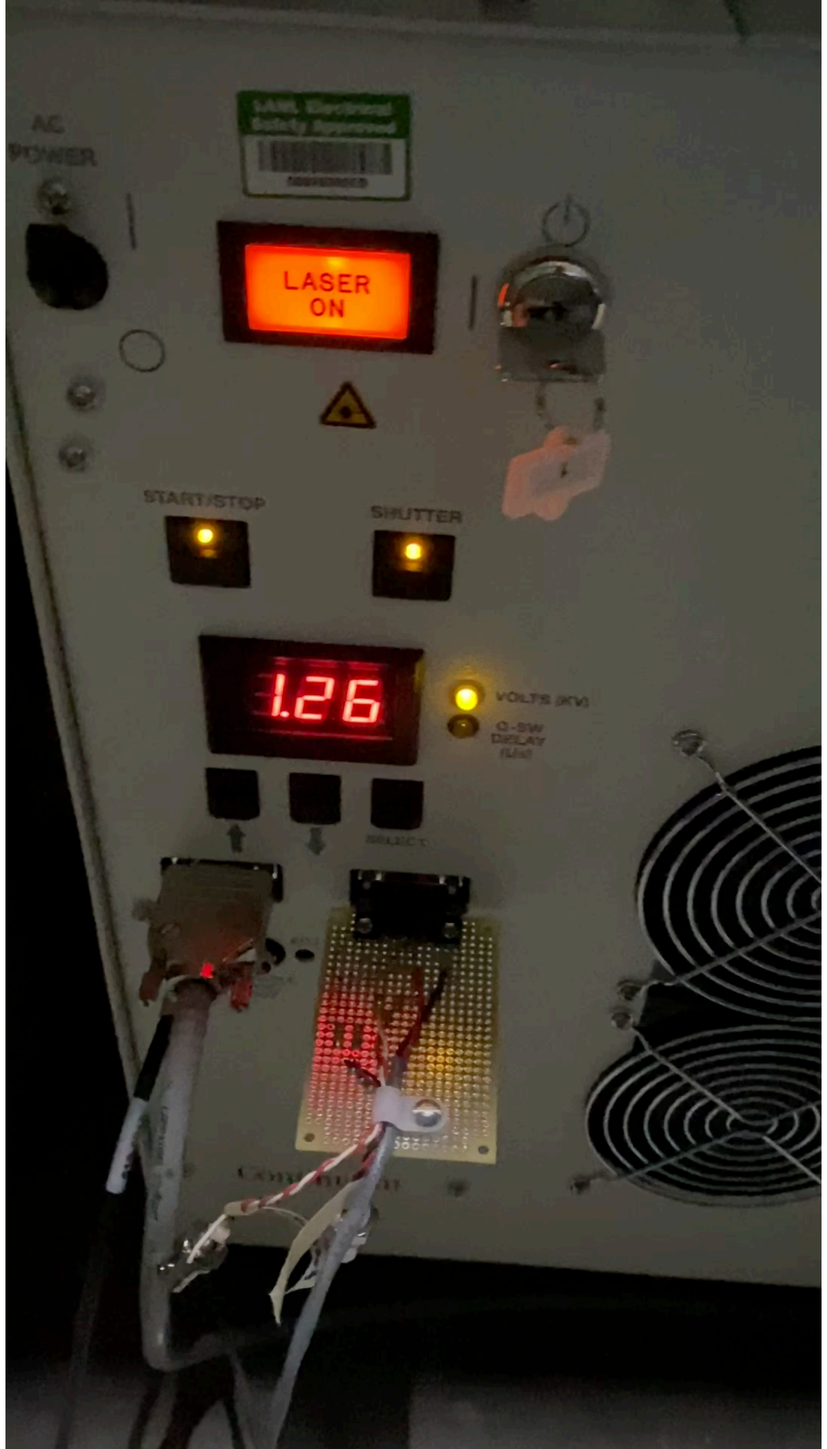
Setup allows further tests on attenuator control



- Need to calibrate EM-1 (BS calibration data waiting for analysis)
- Components to test
  - Unmachined torlon plate
  - Unmachined PEEK plate
  - Machined torlon rod
  - Spare torlon holder for M4
  - Spare torlon target

Getting UV laser as close as possible to the edge





Alignment laser and UV laser (pulsed) aligned after M2

- Measurement plan (can be revised):
  - 1 hour warm up
  - 15 minutes exposure with energy equalized at 10 mJ
  - Close the shutter, check the status
  - 5+15 minutes exposure with energy equalized at 20 mJ
  - Close the shutter, check the status
  - 5+15 minutes exposure with energy equalized at 30 mJ
  - Close the shutter, check the status
  - 5 minutes + 3 hours exposure with energy equalized at 30 mJ

- Status
  - 15 minutes exposure at 18 mJ
    - No detectable effect on samples
    - Measurements paused because of a little bug
    - Eric realized a new attenuator calibration is needed
    - Measurements will be resumed this afternoon